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| | Engineering and Design<br><br>HYDROELECTRIC DESIGN CENTER | |
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DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

ER 1110-2-109

CECW-EE

Regulation
No. 1110-2-109

15 April 1993

# Engineering and Design
# HYDROELECTRIC DESIGN CENTER

## 1. Purpose

This regulation defines the Hydroelectric Design Center (HDC) as the Mandatory Design Center for hydroelectric power and pumping plant design and prescribes the requirements for use of the HDC by the U.S. Army Corps of Engineers (USACE) commands. It establishes policy and provides guidance for interfacing the resources of the HDC with those of the requesting USACE command and designates the U.S. Army Engineer Division, North Pacific, Hydroelectric Design Center, as the Mandatory Design Center.

## 2. Applicability

The regulation is applicable to all HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities having civil works operation and maintenance (O&M), construction, and planning and/or design responsibility for hydroelectric plants and/or pumping plants, either for flood control or water supply.

## 3. References

*a.* ER 10-1-41, Corps-Wide Centralized Functions and Special Missions assigned to Divisions and Districts.

*b.* ER 1110-2-1150, Engineering After Feasibility Studies.

*c.* ER 1110-2-1200, Plans and Specifications.

*d.* ER 1110-2-1454, Corps Responsibilities for Non-Federal Hydroelectric Power Development Under the Federal Power Act.

## 4. Definition

A mandatory design center is a specified USACE command which is assigned one or more permanent technical missions, is Corps-wide in scope, and is utilized by other USACE commands as prescribed by ER 10-1-41. The designated office is to be considered the "lead activity" in the specialized areas where capability must be concentrated for maximum effectiveness, economy, efficiency, and/or preservation of technical expertise.

## 5. Policy

The HDC is established to maintain, within the Corps, the capability and proficiency required for the planning, engineering, design, and criteria development for all existing and new hydroelectric power plants and large flood control or water supply pumping plants (30 cubic meters per second (1060 cubic feet per second) or larger total station capacity). The planning and engineering for hydroelectric power and large pumping plant projects require highly specialized expertise. The decreasing hydroelectric power and large pumping plant workload within the USACE make it necessary to consolidate that workload at a centralized office to preserve the Corps' expertise in these fields. The capability and expertise to execute this highly specialized work now exist within HDC.

## 6. Responsibilities

*a. HQUSACE.* The Chief of the Engineering Division, Civil Works Directorate (CECW-E), is assigned the overall responsibility for oversight of the HDC.

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This regulation supersedes ER 1110-2-109, dated 12 Feb 1985.

The HQUSACE point of contact for all matters concerning the HDC is the Chief, Electrical and Mechanical Branch (CECW-EE).

*b. USACE Commands.*

(1) The USACE commands responsible for managing the project will obtain the services of the HDC for the work listed in paragraph 7. The USACE command will retain overall project responsibility including funding, scheduling, contract management, and inspection. The command will, however, coordinate all scheduling with that of the HDC at the earliest practical date. This date will be not less than 1-1/2 years in advance of the year funding has been budgeted for the required service(s), unless other arrangements are made. The development of any schedule must take into account prior commitments of the HDC. Any conflicts in the scheduling will be resolved by CECW-E. Also, it is incumbent upon the USACE command to furnish the HDC, at the time of initial scheduling, a scope of work in sufficient detail to permit HDC to prepare a preliminary cost estimate of the required engineering services. The USACE command is responsible for having the schedule and cost estimate updated prior to commencement of the work. The requesting USACE command will fund the HDC for the services to be performed and will furnish necessary project information in time to permit the HDC to complete the design on schedule.

(2) The USACE command responsible for managing the project will execute the construction or repair of the powerhouses and pumping plants and procure and install the equipment. The HDC will be kept informed of all anticipated changes to the completed design, and changes will be made only if jointly agreed to by the HDC and the requesting USACE command. If a conflict or difference develops that cannot be resolved by mutual agreement between the parties involved, HQUSACE (CECW-EE) will be notified and requested, by either party, to assist in resolution of the conflict or difference. HQUSACE (CECW-EE) will have the final decision to resolve these conflicts or differences.

(3) The USACE command requiring emergency services, defined as design, preparation of contract documents, or consultation services necessary to restore or replace failed power plant equipment to full operational capability, will be given high priority by the HDC. The USACE command in need of these services will notify the HDC of services that will be required and will fully cooperate with and coordinate in-house resources with those of the HDC.

(4) Responsibility for routine maintenance and repair shall remain with the requesting USACE command. Failure analysis, including testing and evaluation of major equipment, will remain with the requesting USACE command but should be coordinated with and reviewed by the HDC.

(5) When the work done by HDC becomes part of a larger contract or design document, the USACE command will furnish HDC the completed contract or design document for review to ensure proper coordination of HDC's work.

(6) All engineering and design functions not listed in paragraph 7, e.g., hydraulic and hydrologic and geotechnical, will remain the responsibility of the USACE command.

*c. Hydroelectric Design Center.*

(1) The HDC has been assigned mission responsibility for providing engineering services to the requesting USACE command for hydroelectric power and pumping plants. If unable to perform, due to scheduling conflicts, the HDC has the option to utilize A-E services or other available and capable USACE commands to accommodate the schedule of the requesting USACE command. HDC can also utilize resident expertise at Corps laboratories to perform physical or numerical model studies.

(2) The HDC will furnish to the requesting USACE command the best possible cost estimate commensurate with the scope of work provided and the best possible technical design consistent with the stated requirements of the project. The HDC will coordinate its design efforts with the requesting USACE command and will keep that USACE command fully informed regarding the pertinent features and status of the design through monthly progress reports.

(3) The HDC will review, with the requesting USACE command and prior to commencing work on any project, the latest scope of work furnished to ensure that there is agreement and understanding on content, schedule, and cost. A written agreement will then be prepared by HDC confirming the work to be

accomplished, the schedule, and the cost. The HDC will keep the requesting USACE command informed about problems which could delay completion of the design or impact on other aspects of the project. The HDC will also keep CECW-EE informed, through quarterly progress reports, of the status of the design work being performed and of anticipated future workload. If needed, the HDC, after consultation with the requesting USACE command, may establish priorities based on workload and project requirements. However, emergency services, as defined in paragraph 6b(3), will always have high priority.

(4) HDC will be responsible for performing an independent review and approval of all their work.

*d. North Pacific.* North Pacific Division (NPD) is responsible for day-to-day administrative oversight and administrative support of the HDC.

## 7. Work to be Performed by the HDC

This paragraph describes both the mandatory services that must be performed by the HDC and, at the option of HQUSACE or the requesting USACE command, the optional services that will be performed by the HDC.

*a. Mandatory services.* Except for responsibilities, as defined in paragraph 6, which remain at the USACE command, HDC will have mission responsibility to provide engineering services for all hydroelectric work and for all large pumping plants (30 cubic meters per second (1060 cubic feet per second) or larger total station capacity). This includes all major modifications, expansion, and rehabilitation of large pumping plants and hydroelectric equipment critical for the generation of power, such as turbines, generators, intake closure devices, governors, circuit breakers, main power transformers, and excitation and Supervisory Controls and Data Acquisition systems at new or existing facilities, whether Corps owned or whether the Corps is requested by others to provide such services. The HDC must perform the following:

(1) Prepare the electrical, mechanical, and structural portions of reconnaissance reports and other preauthorization studies; preliminary design reports and design memoranda; preliminary cost estimates and studies for uprating, rehabilitation, or replacement of equipment or systems.

(2) Perform the electrical, mechanical, and structural design for pumping stations and powerhouses including switchyards, related facilities, and all hydraulic transient studies for water passages of hydroelectric and pumping facilities. Structural design will include complete plant design, e.g., substructure, superstructure, and equipment support.

(3) Prepare contract cost estimates, plans, and specifications.

(4) Provide technical review of shop drawings.

(5) Provide technical assistance to the Contracting Officer's Representative (COR) during contract period and at all shop and field tests, including model tests. Analyze results, make recommendations, and provide engineering services during construction.

(6) In accordance with ER 1110-2-1454, review non-Federal hydropower at Corps projects with respect to the structural and mechanical features that could affect the integrity and safety of Corps projects.

*b. Optional services.* The HDC, upon request of the USACE command or HQUSACE, must perform the following services:

(1) Prepare or assist in preparation of O&M manuals.

(2) Provide support for hydroelectric and pumping plant training programs involving engineering and design.

(3) Provide support to HQUSACE or USACE commands on hydroelectric and pumping plant matters. This includes preparation of new criteria, update/revision of existing criteria, and execution of special studies to determine equipment condition indicators and/or reliability projections.

(4) Assist in periodic inspections.

(5) Test and evaluate the performance and condition of existing major equipment to determine whether replacement or rehabilitation is necessary.

(6) USACE commands can assign COR authority to HDC for: approving technical submittals, witnessing and approving model tests, and witnessing and approving major equipment field performance tests.

(7) Conduct failure analyses for major equipment.

(8) Perform engineering services for pumping plants regardless of plant size.

(9) Review testing and evaluation, performed by others, of existing major hydroelectric equipment performance to determine whether replacement or rehabilitation is necessary.

(10) Review and coordinate major equipment failure analyses performed by USACE commands.

(11) Provide engineering services for minor hydropower equipment.

(12) Revise contract drawings to reflect "as-built" conditions.

## 8. Method of Operation

The method of operation of the HDC and specific operational requirements for both the HDC and the requesting USACE command are detailed below:

*a. General.* The HDC will evaluate requests from USACE commands and will assign engineering functions to make maximum utilization of HDC resources and to maintain technical capability and expertise within the HDC.

*b. Activity scheduling.* Each year in July, HDC will request Commanders of the USACE commands, having responsibility for Civil Works projects, to provide the best estimate of their anticipated needs for HDC services in terms of project dollar value of design effort or assistance for the ensuing 2- to 5-year period.

*c. Funding for HDC services.* The requesting USACE command will fund the HDC for services to be performed. The HDC will develop a preliminary cost estimate for design services based on the scope and schedule agreed to between the HDC and the requesting USACE command. Any revisions made to the cost estimate must be mutually agreed to by the parties involved.

*d. Specific project requests.* The USACE command requiring technical assistance will contact the HDC at the earliest practicable time to schedule the work. The HDC, upon receipt of a scope of work, will provide the requesting USACE command with a preliminary schedule and estimate of cost for their services. The scope of work, schedule, and cost estimate should be finalized before the work is initiated.

*e. Review and approval process.* The review and approval process will be in accordance with the requirements of ER 1110-2-1150 and ER 1110-2-1200.

*f. Transition plan.* It is intended that the mission of providing hydroelectric and pumping plant engineering services be consolidated into HDC with minimal impact and interruption. This consolidation should be completed within 2 years for hydroelectric engineering services and within 2 years for pumping plant engineering services following the publication date of this regulation. To help ensure a smooth and orderly transition, those USACE commands currently providing such services will immediately notify HDC of their work in progress and anticipated schedule for completion. HDC will promptly arrange a meeting with those USACE commands and CECW-E to develop a specific transition plan. As a minimum, the transition plan will include the following:

(1) Provisions for transfer of future work to HDC.

(2) Development of a procedure wherein HDC can identify and utilize the existing residual expertise in the incumbent USACE command in accomplishing HDC's assigned mission.

*g. Interoffice communication and coordination.* Direct correspondence and communication between the HDC and the requesting USACE command are authorized. Such communication is necessary to define scope(s) of work, to determine schedule(s) and funding, to coordinate the design, and to keep the respective parties fully informed as to the status of the work.

## 9. Research and Development

Upon direction from CERD, the HDC will be responsible to participate, review, or monitor research and development work unit activities for hydroelectric power plants and pumping plants. The HDC will participate with other field users in identifying Civil Works research and development needs. Staff members of HDC will also participate, as members of the Civil Works R&D Field Review Group in their area, in reviewing,

advising, and assisting in the technology transfer of research results. HDC may also conduct joint research, development, and demonstration projects with the Corps laboratories as directed by CERD.

### 10. Water Hammer Studies

The HDC is hereby granted authority to accept the task of performing water hammer studies for other than hydroelectric and pumping plant water passages.

### 11. Waiver to this Regulation

Requests for waivers to this regulation must be submitted in writing to CECW-EE. The Chief, Engineering Division, Directorate of Civil Works, has the authority to approve waivers to this regulation. Issuance of the official approval or denial to the waiver request shall be the responsibility of CECW-EE. The length of time to review a waiver request will not exceed 30 days.

FOR THE COMMANDER:

WILLIAM D. BROWN
Colonel, Corps of Engineers
Chief of Staff